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April 28, 1988

Ms. Alice C. Fuerst
Cherokee County Project Manager
Superfund Branch
Waste Management Division
U.S. Environmental Protection Agency
Region VII
726 Minnesota Avenue
Kansas City, Kansas 66101

RE: Cherokee County CERCLA Site

Dear Ms. Fuerst:

These comments on the "Final Draft Groundwater and Surface Water Operable Unit Feasibility Study, Galena Subsite, Cherokee County Site, Kansas, February 26, 1988, WA No. 102-7L37.0" (OUFS) are submitted on behalf of the following potentially responsible parties (PRPs): AMAX Inc., ASARCO, Inc., Eagle-Picher Industries, Inc., Gold Fields Mining Corporation, N.L. Industries, Inc., St. Joe Minerals Corporation and Sun Company, Inc. These comments on behalf of the above PRPs are not an admission or waiver of any defense (and should not be considered or construed as an admission or waiver) concerning their potential liability for response costs at the Cherokee County Site, or concerning the propriety of the U.S. Environmental Protection Agency's (EPA's) activities there.

As a preliminary matter, we would like to note that EPA originally provided only thirty (30) days (to April 6, 1988) to review and submit written comments on the OUFS. The PRPs did not believe that 30 days were sufficient to thoroughly review the OUFS and extensive new supporting information (including 2 appendix volumes of several hundred pages with raw data, modeling results and data evaluations) and to prepare detailed comments. Accordingly, the PRPs requested a 90-day extension of the comment period (letter to Alice C. Fuerst from Peter Keppler dated March 15, 1988). In follow-up telephone conversations, EPA indicated that they would not act on our request until after their scheduled meeting with the PRPs on March 30, 1988 --- after which

time only 7 days of the original comment period remained. At the March 30 meeting, EPA responded by extending the formal comment period by 24 days to April 30, 1988. While the extension is genuinely appreciated, we believe that the extended comment period is still too short for meaningful public participation -- especially in light of EPA's failure to respond promptly to our original request for an extension.

Attachment A to this letter is a technical review of the public health and environmental risk assessment and related areas prepared for the PRPs by Charles A. Menzie & Associates. Rather than attempt to summarize and incorporate the comments contained in the technical review, we have incorporated this review document in its entirety -- as part of the PRPs comments on the OUFS.

General Comments

As we have stated on numerous occasions in the past, the PRPs are gravely concerned with the EPA's erroneous and unsupportable position that historical mining activities are the sole cause of the elevated metallic ion concentrations recorded in the shallow aquifer, surface waters and soils within the Galena Subsite. This position is perpetuated in the Groundwater and Surface Water OUFS.

The EPA's position in the Groundwater and Surface Water OUFS, as in previous portions of the Remedial Investigation/Feasibility Study (RI/FS) for the Cherokee County Site, has been that historical mining activities have changed the surface and subsurface characteristics of the area and that these changes, through resulting alterations in the hydrological systems, have been the sole or major cause of the elevated metallic ion concentrations recorded in the shallow aquifer in the vicinity of the site and in the surface waters draining the site.

The PRPs acknowledge the fact that historical mining activities created underground voids and resulted in the placement of mine wastes on the surface. These actions and resulting alterations in hydrology have exposed some of the naturally occurring sulfide minerals to more oxidizing conditions and, thus,

altered the mobilization of contained metallic ions. However, comparing the tonnage of mineralized material assumed by the EPA to remain underground (page 6-7 of the OUFS) with the quantity previously mined (page B-11 of the OUFS) reveals that mining activities removed more than 80 percent of the mineralized material naturally occurring in the Galena Subsite. Accordingly, by EPA's own estimates, mining has removed a majority of the sulfide materials which were naturally oxidizing and releasing metallic ions to the environment. We believe the effect of the removal of this source has more than offset the effect caused by the increase in exposure for a fraction of the remaining mineralization. In any event, EPA has failed to quantify or otherwise take these factors into account in its approach to this OUFS.

The PRP's are also gravely concerned with the obvious bias and slanted interpretations of results in an attempt to make the point that historical mining activities are the cause of the existing water quality conditions within the Galena Subsite. For example,throughout the OUFS the term acid mine drainage (AMD) is misused to also include the oxidation of pyritic materials not associated with mines nor discharges associated with mines. Also, from the information contained in the OUFS the reader is led to believe that EPA has data to document that in its pre-mining condition Short Creek supported a diverse biota. From our understanding of pre-mining metallic ion concentrations that likely occurred in Short Creek (see discussion below), and from data available from other undisturbed areas where a stream flows through a sulfide mineralized zone -- for example Red Dog Creek in Northwest Alaska (EPA, 1984) -- we strongly doubt that Short Creek ever supported a diverse biota.

The PRP's position throughout the RI/FS for the Cherokee County Site has been that, although mining has caused changes, the concentration of metallic ions observed in the shallow aquifer and surface waters today are not significantly different than the concentrations that occurred in the pre-mining condition. The PRPs have repeatedly requested that the EPA take the naturally occurring background concentrations into consideration in the overall RI/FS, especially in the development of the overall goals and objectives of any remedial action. The Kansas Department of Health and

Environment also acknowledged the potential for naturally occurring elevated concentrations of some ions and recommended in their letter to EPA dated May 12, 1987 (Gayula F. Kovach to Alice C. Fuerst) that "it would be appropriate to estimate what these (background) conditions are." The EPA has not responded to these requests and we believe the consequences, not surprisingly, are reflected in the results of the Ground Water and Surface Water OUFS: by EPA's own admission in that document, none of the developed alternatives will meet the unrealistic long-term goals and objectives established by the EPA for the Galena Subsite.

Since the EPA was not willing to address the background conditions in a meaningful fashion, the PRPs retained a group of highly experienced experts to investigate and to prepare a report concerning the likely pre-mining conditions within the Galena area. That report, entitled "Pre-mining Surface and Shallow Ground Water Quality in the Vicinity of Short Creek, Galena, Kansas" (Angino, 1988) was previously submitted to EPA by the PRPs under a cover letter from Peter Keppler to Alice C. Fuerst dated March 22, 1988. It concluded that because of normal weathering and chemical attack of the naturally exposed sulfide ore body that occurred at Galena, elevated concentrations of metallic ions were undoubtedly present in Short Creek and the shallow groundwater system in pre-mining time, at levels that exceed current standards and the targets established in the RI/FS for any remedial actions at Galena.

This conclusion is confirmed by the water quality modeling contained in the Ground Water and Surface Water OUFS for Remedial Alternative 2. Under this alternative, all surface mine wastes would be removed, all shafts and underground voids would be backfilled and surface features would be improved to a condition approximating that which likely occurred in the pre-mining period. Accordingly, based on the fact that the underground workings would be filled with relatively inert backfill rather than sulfide mineralization, this alternative conservatively approximates the pre-mining condition for the subsite. The water quality modeling contained in the OUFS predicts that -- even after remediation to those pre-mining conditions -- the concentration of metallic ions will exceed the EPA-defined legally applicable or relevant and

appropriate requirements (ARARs). The PRPs believe that the predicted concentration of metallic ions would be significantly higher if the mine voids were still filled with sulfide mineralization (commercial ore), as occurred in the actual pre-mining condition, rather than with the inert backfill mixture -- thus further supporting the conclusions of Dr. Angino's report.

In summary, we acknowledge that mining has caused some changes to the physical and hydrological characteristics of the Galena Subsite, but we strongly disagree with the information presented in the Ground Water and Surface Water OUFS on the extent of these changes and the effect that these changes may have had on the background metallic ions concentrations in the shallow aquifer and surface waters of the Galena Subsite. In light of the conclusions presented in the Angino report, we believe that EPA is obligated to re-evaluate not only its conclusory position concerning the purported effect of mining on water quality, but also its fundamental approach to the goals, objectives and targets for any remedial actions at the Galena subsite (as well as the Cherokee County site as a whole).

Finally, the PRPs provided extensive comments on the EPA characterization and evaluation of the ground water resources in our comment letters on the Alternative Water Supply (AWS) OUFS (letter to Alice C. Fuerst dated December 10, 1987) and the Site-Wide Water Supply Inventory Technical Memorandum (letter to Alice C. Fuerst dated February 1, 1988). Since this OUFS tends to incorporate and expand on the flaws we commented upon in these earlier letters, we are requesting that the above letters be incorporated by reference into these comments and the administrative record for this OUFS.

Public Health and Environmental Risk Assessment Comments

The PRPs can understand the need to be conservative in the assessment of potential public health and environmental risks, but the assessments and supporting assumptions contained in Section 3 of the OUFS are totally unrealistic and unprofessional. As noted in Charles A. Menzie & Associates' technical review (Attachment A), the methods used in the assessment are outdated and the assessments are not meaningful. As a preliminary but

significant matter, on page 1 of the OUFS it states that "This Groundwater/Surface Water OUFS was developed with the assumption that EPA's selection of a water supply remedy, expansion of the municipal water system, will be implemented." Yet, in direct contradiction of that statement, ingestion of contaminated drinking water from the shallow aquifer is described by EPA on page 3-19 as one of the two primary exposure pathways included in the assessment. Further, the estimated contaminant intakes calculated for the Groundwater and Surface Water OUFS are different than those included in the AWS OUFS and seriously call into question the risk assessment and remedy selection contained in the AWS OUFS. Accordingly, the PRPs believe that the AWS OUFS Record of Decision (ROD) must be reopened and reconsidered in light of EPA's revised contaminant intake calculations.

The exposure pathways for surface water included in the OUFS are incidental ingestion and dermal absorption during swimming. On page 3-10 it is noted that Schirmerhorn Park, located at the southern edge of Galena on Shoal Creek, is a popular picnic and swimming resource for the entire area. Yet the risk assessment is based on a child swimming one hour each day -- including during the winter -- in the area waters with the highest metallic ions concentrations (Short Creek, Owl Branch or mine ponds). As noted, most swimming likely occurs in Shoal Creek at Schirmerhorn Park where, as shown on page 3-10, the maximum recorded concentrations of metallic ions are below drinking water standards. Inspection of the Galena subsite clearly suggests that any swimming in other surface waters would likely be extremely limited and infrequent. Further, the exposure pathways considered are only appropriate to full body contact recreation activities and would not apply to wading and other activities. Short Creek, Owl Branch and other surface waters included in the assessment, because of their physical characteristics, simply cannot provide for full body contact recreational activities. Even if they did, the estimated exposure by ingestion and dermal absorption contained in the OUFS are grossly in error as noted in Attachment A.

To achieve the contaminant intakes projected for the ingestion of surface solids by children, we are to believe that a 10-Kg child (approximately one year old child) would travel <u>daily</u> to the mine waste areas and selectively

consume one gram of mine wastes containing the highest concentration of metals. While we can understand how an unsupervised older child may, through the course of playing, occasionally and incidentally ingest some dirt and waste material, we believe that the assumptions made for this pathway are totally unrealistic, and that any possible risks to a 10-kg child (who presumably would be supervised) are grossly overstated. As discussed in Attachment A, a more appropriate estimate for ingestion of surface solids by children is about 100 mg/day from all sources. Indeed, even for an older child the ingestion of one gram of waste would be unlikely and certainly not a daily occurrence. Further, if the ingestion is to occur over an extended period of time, it would be more reasonable to assume that the material consumed would contain the average, rather than maximum, concentration of metals. This is especially true given the fact that the EPA has determined as part of their waste characterization study, as summarized in Appendix A.4 of the OUFS, that the maximum concentration of metals occurs in rock and not in material that could be incidentally ingested. Finally, and significantly, it should also be noted that in the pre-mining condition the ore body was exposed at the surface throughout this area and that this exposure pathway is a natural feature.

The evaluation of the exposure from the ingestion of fish is another example of slanted presentation of information. Under this topic on page 3-17 of the OUFS it states "Fish in these streams and lakes naturally bioaccumulate certain metals. Ingestion of these fish may in turn result in exposure to humans." Since fish do not occur in Short Creek, this comment must refer to the Spring River and Empire Lake. Yet, on pages 88 and 93 of the Phase I Remedial Investigation Report for the Galena Subsite it states "Results (fish tissue analysis) suggest that bioaccumulation of metals is not occurring to any extent in game fish from Empire Lake, and the quantity of metals in forage and game fish collected in Empire Lake is similar to amounts in forage fish collected from various locations in Kansas." Accordingly, the information presented in the OUFS is not a fair and factual presentation of the available information. Further, the OUFS states on page 3-17 that "Contaminant intakes were estimated by assuming 70-Kg individuals consume 6.5 grams of game fish

per day ...." However, on page 3-18 it states that "For children, the exposure scenario consists of a 10-Kg child consuming 1 liter of contaminated groundwater, 1 gram of contaminated mine waste, 50 ml of contaminated surface water and 6.5 grams of fish per day." It is obvious that the 6.5 grams of fish per day was to apply to an adult; however, in the final analysis it appears that this quantity was also used for 10-Kg children. While some adults may consume 6.5 grams of fish per day, it is unlikely that a one year old child would consume this amount.

Overall, the PRPs believe that the assumptions made in the public health assessment are totally unrealistic and that this, along with the use of maximum contaminant concentrations for each of the exposure pathways, has resulted in grossly over-estimating the total contaminant exposure. These unrealistic contaminant exposures were then compared to a variety of standards -- all of which have their own built-in safety factors to account for uncertainties -- to produce an unacceptable and unscientific assessment of potential hazards to public health.

The environmental risk assessment contained in the OUFS is very straightforward and consists of comparing the observed water quality in the surface waters to the applicable state and federal water quality criteria for the protection of aquatic life. The comment period provided was not adequate to review the raw data or to validate the summaries provided. Accordingly, we cannot comment in detail on this assessment. However, we do have some general comments.

The environmental assessment assumes that in their background condition (pre-mining), the Spring River and its tributaries were not affected by elevated concentrations of metallic ions and that any exceedences in water quality criteria for metallic ions are the direct result of mine drainage from historical mining operations. As discussed earlier and supported by Dr. Angino's report, the waters of Short Creek and other streams in the Cherokee County Site draining mineralized areas contained elevated concentrations of metallic ions prior to any mining activity. Streams flowing directly over or incised into sulfide minerals, such as the segment of Short Creek, likely had significantly elevated concentrations of metallic ions and very limited

aquatic biota. A very similar situation has been reported by the EPA for Red Dog Creek in Northwest Alaska (EPA, 1984). These tributary streams have contributed metal loadings to Spring River long before mining was initiated in the district.

In addition to the natural sources of metallic ions to the waters of the subsite, there are many documented non-mining manmade sources of metal loadings to the Spring River and its tributaries. One of these sources, Farmers Chemical Company's fertilizer plant, contributes significant loadings of nutrients and metallic ions to Short Creek immediately upstream of the Galena Subsite. Although the OUFS attempts to downplay this source, we believe the information in Gold Fields Mining Corporation's September 25, 1987 comment letter to EPA clearly demonstrates that this is a significant source of aluminum, cadmium, nickel, zinc and other contaminants to Short Creek. The concentrations of zinc and cadmium in Short Creek immediately downstream of this facility are more than four times the applicable water quality criteria for aquatic life. The PRPs have consistently requested that the EPA identify Farmers Chemical Company as a PRP at the Cherokee County Site, but to date we are not aware of any action by EPA on that matter.

On pages 3-58 and 3-59 of the OUFS the EPA continues to attribute the reduced diversity of macroinvertebrates in Spring River downstream of Empire Lake to elevated concentrations of metals. As discussed in an earlier comment letter (letter to Alice C. Fuerst dated October 19, 1987) we do not believe the existing data is sufficient to support this position, and, we believe other factors could be responsible for the noted diversity reductions.

Goals and Objectives and Degree of Cleanup Comments

The OUFS establishes short-term and long-term goals for the remedial measures developed for the Galena Subsite. As stated on page 4-11 of the OUFS, "the long-term goals for the selected remedial measure are to protect human health and the environment through attainment of MCL's for groundwater and AWQC for surface waters within the Galena Subsite and in the Spring River adjacent to and downriver of the subsite." As discussed above, and at the

EPA/PRP meeting on March 30, 1988, Dr. Angino's report amply demonstrates that achieving these goals -- which, as discussed below, does not seem possible -- will result in conditions better than those naturally occurring in the Galena subsite. Under those circumstances, we believe that the long-term goals identified in the OUFS -- which may generally be desirable objectives -- are inappropriate for remedial action at the Galena subsite, and are therefore arbitrary and capricious in the context of the present OUFS. They are also unlawful and outside the scope of CERCLA. See Section 104(a)(3)(A).

Further, the short-term goals are merely general objectives: "to improve groundwater quality and reduce metal loadings to the surface water system." Id. These goals are not quantified, and are clearly not designed to meet the contaminant-specific ARAR's specified in the long-term goals. Although not clearly stated, it is obvious that the overall approach of the OUFS, including the development, screening and analysis of remedial alternatives, is predicated on the assumption that achievement of the short-term goals will somehow bring about achievement of the long-term goals. For example, on page 1-6 of the OUFS it states "The overall purpose of this OUFS is to provide a basis for selecting remedial actions that will achieve the stated short-term goals and thereby, protect public health and the environment from mining-related contaminants in the Galena Subsite groundwater and surface water systems as stated in the long-term goals." However, the OUFS does not indicate how achievement of the short-term goals will bring about achievement of the long-term goals, or when the long-term goals will ultimately be achieved, if ever. Indeed, even the OUFS acknowledges the uncertainty in this assumption by stating on page 8-45 that "ARAR's may be achieved in the long-term as an indirect result of the remedial actions. This prediction cannot be made with available data."

Because the short-term goals are vague, general concepts, and because the Angino report strongly suggests that the long-term goals are unrealistic to begin with, the Agency has not met its burden of demonstrating that the short-term goals are an appropriate basis for selecting a remedial action. Indeed, because the OUFS itself states that the selected alternative will not meet contaminant-specific ARAR's specified as long-term goals (pp. 34-36), we

believe that the short-term goals identified in the OUFS for remedial action at the Galena subsite are inappropriate, arbitrary and capricious, and outside the scope of CERCLA. See Section 104(a)(3)(A).

Accordingly, the PRPs believe that the overall approach used in the OUFS is fundamentally flawed and that implementation of any of the defined remedial actions will (as discussed later) delay rather than facilitate the establishment of the stated long-term goals. In an earlier letter to EPA on the site remediation goals (letter to Alice C. Fuerst dated August 28, 1987), it was noted that several of the long-term goals were unrealistic and unattainable because of EPA's failure to consider naturally-occurring background concentrations in their formulation. We believe that that point is amply demonstrated by the fact that none of the alternatives considered for detailed analysis will achieve the stated long-term goals.

Surface Waste Comments

EPA has defined mine wastes in the OUFS as being a "collective term that includes bullrock, dump material, chat, scattered minor amounts of slag, and trace amounts of tailing" (Appendix A, page A-11). However, as discussed below, in its activities carried out to characterize this waste, EPA appears to have concentrated exclusively on piles of broken rock (bullrock or dump material) and ignored the chat (tailing from gravity separation processes) which constitutes some 58% of the surface waste at the Galena subsite. Preliminary sampling of chat by the PRPs indicates that the chat is much lower in lead content than the coarse rock sampled by EPA. Because EPA's determination of its remedial action and associated costs, as well as EPA's risk assessment, are based on the characterization of the waste, EPA has greatly underestimated the cost of its remedial action proposal as well as greatly overestimating the risk posed by the existence of mine waste piles.

An observer from one of the companies identified as a PRP was present during part of the sampling carried out by EPA. The observer was told by the sampling team that their instructions were to sample only coarse rock piles as their metal content would be higher than the chat piles. Subsequently, when

an engineer retained by one of the PRP companies to estimate the volume of mine waste performed his field activities, he came across 54 of EPA's 160 sampling point stakes and noted that all of them were located in rock piles and none in chat piles. This appears to contrast sharply with the statement in Section D.5.1.2.1 (Appendix D, OUFS Report) that "sample locations were selected to best represent the relative proportion of each waste type in each zone." Another significant error in the sampling procedure occurred when EPA confined its samples to the surface of the waste piles, except for two locations where trenches were dug to a depth of four feet. Given the large volume of heterogeneous materials present on the Galena subsite, the evident vertical and horizontal variations with a given pile -- let alone between piles of different materials -- and the limited biased sampling that was conducted of these materials, we do not believe that the overall waste materials present have been realistically or properly defined.

EPA has supplied voluminous field x-ray fluorescence (XRF) data in the OUFS. This data, by EPA's own admission, correlates poorly to calibration curves due to the "large particle size containing a heterogeneous size range of minerals" (OUFS Appendix D, Section D.5.2). The use of the field XRF during sample collection and sample compositing is likely to have biased the final results. The laboratory data is likewise suspect due to the way the samples were collected, mixed, and reduced. As noted above, significant sampling errors occurred. Subsequently, EPA divided the samples by cone and quartering, which is not a reliable method for coarse materials of a heterogeneous nature. All the handling of the samples, including cone and quartering, transporting, and laboratory size reduction offer the potential for gravity segregation of heavy minerals. It is noted, for example, that in seven of EPA's eight composite samples for the various waste zones iron is three to five times higher by the total metals ("wet chemistry") method than by XRF, but lead is only one to three times higher. This does not substantiate EPA's theory that the chemical digestion was incomplete (OUFS Appendix A, page A-14). However, it does suggest that the splits have segregated with respect to light and heavy minerals. If there were no differential settling of mineral fractions in the sample splits, then one

would expect similar multiples for iron and lead. The fact that the lighter metal (iron) had a higher multiple between wet chemistry and XRF results than the heavier metal (lead), suggests that the sample splits had segregated. With all the factors of sample bias and sample handling and processing errors considered, it is apparent that overall the sampling is unreliable; therefore, none of the analytical data can be relied upon.

EPA states that lead values determined by wet chemistry may be too low since laboratory XRF readings are higher (OUFS Appendix A, page A-14). We believe instead that an examination of the data suggests that the split of the sample analyzed by XRF had segregated with respect to light and heavy minerals.

As noted above, one of the PRP companies (AMAX Inc.) employed an engineer to carry out a field investigation of the volume of waste stored at the site (Attachment B). This investigation was prompted by a review of the information presented in the OUFS. EPA estimated that 283,000 cubic yards of waste were present within the eight areas delineated for sampling in the OUFS that comprise a total estimated area of 891 acres. This calculates to an average depth of less than 2-1/2 inches, which by simple field observation is a serious underestimate. The field work carried out for AMAX resulted in an estimate of 1,279,000 cubic yards of waste rock, chat, and other mine wastes.

EPA has also erred in calculating tonnage from the waste volume estimates. EPA has stated that 327,000 tons are present, indicating that a value of 1.15 tons per cubic yard was used. A standard earthmoving reference such as the "Caterpillar Handbook", indicates a value of at least 1.35 tons per cubic yard would be appropriate. This value would yield approximately 382,000 tons, based on EPA's erroneously low volume estimate and over 1,725,000 tons based on the PRP's volume estimate of 1,279,000 cubic yards.

Metals concentration levels for leachate from the surface mining wastes were determined by a modification of the EPA toxicity test, using a 48 hour "batch" extraction procedure with a 4:1 liquid to solid ratio of sulphuric acid. Thus, the sample was prepared (ground to the appropriate particulate size) then agitated for 48 hours with the sulphuric acid (see OUFS pages A-14, A-26). It is said that this will simulate conditions in the mine waste piles.

These data are then used, together with the deionized water leach data (page A-25), for the mass load modeling -- see Section A.7.3.3. pages A-86 through A-90. However, the EPA toxicity type test is a non-flow related, mass leach test that does not simulate natural conditions, because it assumes a steady-state and does not take into account intensity and duration of rain fall events, drainage dynamics, and the highly permeable nature of the surface wastes. Accordingly, the laboratory leachate data and the modeling results based on them cannot appropriately be used as a basis for developing remedial alternatives in the OUFS.

Preferred Remedial Action Alternative Comments

The remedial action alternative proposed by EPA and transmitted by letter dated February 19, 1988 from Rowena L. Michaels, Director, EPA Region VII Office of Public Affairs, was not specifically described or analyzed in the OUFS. The preferred alternative is described as "a modification of the remedial actions described in the Operable Unit Feasibility Study report" and is also described as "very similar to alternative three." Although the preferred alternative is very similar in some respects to Alternative 3, there is one major difference in that the preferred alternative does not include the partial backfilling of the mine voids. Partial backfilling was a major component of this alternative. EPA's discussion of the proposed plan states "The effectiveness of such action (partial backfilling) is questionable and, therefore, is not preferred by EPA or KDHE." However, neither the OUFS nor the brief discussion of the preferred plan provides any analysis supporting the EPA's position that partial backfilling is of questionable effectiveness. Further, the OUFS employs modeling to predict the overall effectivenss of the alternatives considered in detail and the deletion of the partial backfilling component of Alternative 3 -- even if it had questionable effectiveness -- would change the overall modeled effectiveness of this alternative.

In our meeting on March 30, 1988, we specifically requested, and the EPA agreed to provide, the analysis supporting EPA's decision to delete partial backfilling and the modeling results of the overall effectiveness of the

preferred (i.e., modified) alternative. The EPA also acknowledged that at the time the modified alternative was selected, EPA had not modeled nor evaluated its overall effectiveness. As of this date we still have not received the supporting analyses; without this information or revised detailed cost estimates, it is impossible to thoroughly analyze the preferred alternative. However, we do have some comments on the estimated costs and overall technical feasibility of the preferred alternative.

The preferred alternative is described as providing for removal and treatment through milling and flotation of surface mine wastes, sale of metals removed from the wastes to help defray a portion of costs, and disposal of tailings into mine voids. The plan also calls for surface drainage diversions, recontouring of the surface to remove ponding and infiltration, and plugging or repair of wells extending into the Roubidoux Formation.

One of the PRP companies (AMAX Inc.) utilized sample splits obtained from EPA plus some samples obtained independently from chat piles to carry out a preliminary bench scale testing program for metallurgical recovery from this material (Attachment C). As noted above, the samples are not likely to be representative and have other deficiencies in terms of metallurgical testing. One such deficiency is the fact that by taking samples from the surface of the piles, the samples are of rock which has been subjected to many years of erosion by wind and rain. Because in the Galena area most mining was completed by the first decade of the 20th century, most of this rock has then been subject to over seventy years of such erosion. The result would likely be that clay materials are no longer present in the samples. Clay materials can have a very significant effect on extractive metallurgy processes causing additional process steps to be incorporated to prevent interference with recovery. Nevertheless, AMAX utilized the samples to do preliminary testing to determine if concentration or the eroded surface samples by conventional metallurgical means is feasible. It was found that a concentrate can be produced but a final determination of whether this concentrate is marketable has not been made. It should be noted that if the concentrate cannot be marketed, or if there are intermediate by-products of the process which cannot be marketed, disposal as hazardous waste could be required, causing a

significant additional expense rather than producing a cost offset as assumed in the OUFS.

Based on the bench scale testing, a preliminary flowsheet was designed for a recovery plant and cost estimates for constructing and operating the plant were made based on that flowsheet. One of the most significant factors involved in estimating the costs for the metallurgical plant concerns the amount of material to be processed and the time span over which the plant will operate. EPA has assumed, based on its estimate of 283,000 cubic yards (erroneously calculated by EPA to represent 327,000 tons) a plant capability of 700 tons per day would be operated 2 years on a 5-day, 24-hour-per-day work week basis to process all of the surface wastes. EPA further believes that a plant of this size could be skid-mounted so as to be movable to different areas of the Galena subsite.

As indicated in the attached AMAX report, a plant of this size would not be readily movable and would cost between $6 and $9 million (say $7.5 million) for its construction even if used equipment were employed. This compares to EPA's estimate of $610,000 for a plant of that size. In addition, EPA has estimated the operating and maintenance costs of this plant to be $3.96 per ton whereas the AMAX estimate is between $10.53 and $13.38 per ton (say $12 per ton). This would result in a two-year cost of $3.9 million compared to EPA's estimate of $1,296,000. When the more accurate estimates for the amount of waste rock present at the Galena subsite are taken into account (1,727,000 tons), the actual operating and maintenance costs become $20,724,000 and the time span of operation becomes ten years.

We further believe that EPA has underestimated the hauling costs for the material. Based on the AMAX report and the more accurate estimate of tonnage present, this cost would be $4.4 million as compared to EPA's estimate of $49,000. Finally, we believe that EPA's cost for tailing disposal is similarly underestimated. Much geophysical investigation and drilling of numerous bore holes will be required to locate mine openings. When tailing is placed into the openings, it will not flow uniformly like a liquid but will tend to mound up beneath the point of entry and plug the bore hole, thus requiring drilling of additional holes into the same openings. We have not

made a separate estimate of the tailing disposal costs but only note that we believe EPA's estimate to represent only a fraction of the actual cost that will be incurred.

Based on those items which we have calculated (excluding tailing disposal), our estimate of about $32.6 million compares to EPA's estimate of $2.155 million for the same portion of the remedial action alternative.

We have not attempted to estimate in detail costs of the other items required by the preferred remedial action alternative due to the lack of time available for comment. However, a preliminary review of these costs by experienced engineers leads us to believe that these costs -- for example the cost estimates for the surface water diversions, concrete lined channels, surface recontouring and deep well remediation -- have been significantly underestimated as well.

Finally, we note that EPA's proposed remedial action will have little effect on the metal levels available to enter the groundwater and surface water. This is because only between 40 and 70 percent of the lead is likely to be recovered by the proposed milling process, with similar low recoveries of other metals; it is also due to the fact that in-place mineralized rock will remain at or near the surface in many areas. EPA's choice of a remedial alternative fails to take into account volume estimates and metal content for exposed in-place rock. There are numerous areas where old excavations are exposed which appear to be geologically similar to material present in waste piles (which would be expected given the nature of the area and the type of excavations that were carried out). Thus, even if the surface waste piles were removed, vast amounts of similar rock would remain in place. The in-place rock would be expected to have an impact on the groundwater and surface water similar to that which might be caused by the waste rock piles, which further underscores the ineffectiveness of EPA's selected remedy and its inability to meet ARARs in the short- or long-term.

It is also important to note that the residual sulfide mineralization remaining underground would continue the natural geologic process of providing metallic ions to the shallow groundwater system and surface waters until these materials are totally oxidized and the contained ions are flushed from the

area. If the estimates of the quantity of mineralization remaining underground and the loadings to area waters given in the OUFS are correct, then under the existing conditions it would take more than 1,000 years for the residual sulfide mineralization to be flushed from the system. (It must be emphasized again that the flushing process began long before mining, and accounts for the naturally-occurring elevated metallic ion concentrations.) If it is EPA's objective to reduce metallic ion loadings, we note that measures which reduce the rate of oxidation and mobilization of metals, as included in all alternatives, would merely extend the time required for the contained metallic ions to be flushed from the system. For example, if an alternative reduces metals loadings by 50 percent over the existing conditions, it would take more than 2,000 years for the contained metallic ions to be flushed from the system. During this flushing period the metallic ions concentrations in the shallow aquifer and surface waters would continue to exceed the ARARs under all alternatives considered for detailed analysis in the OUFS, as indicated by the modeling conducted by the EPA. In any event, we note again that the elevated metals concentrations that would exist during the 1,000 year period, although not meeting ARAR's, would approximate natural pre-mining conditions and are not the proper subject of CERCLA expenditures.

Finally, as discussed earlier, the proposed alternative will not meet contaminant-specific ARARs in the short-term, and there is no demonstration or other basis to conclude that they will be met in the long-term. As the PRPs have commented in the past, compliance with those ARARs is technically impracticable from an engineering perspective, due in large measure to natural geologic conditions, and there is accordingly no rational basis for selecting the preferred alternative.

No Action Alternative Comments

As noted in the OUFS, the no action alternative was retained for analysis to provide a baseline for comparison of remedial alternative effectiveness; it was not considered as a potentially viable alternative. The PRPs believe, based on the information contained in the OUFS, that this alternative with appropriate administrative controls could provide as much protection to human

health and the environment as provided by the currently proposed preferred alternative, and at significantly less cost.

The two primary exposure pathways identified in the OUFS are incidental ingestion of surface solids, and drinking of contaminated water from the shallow aquifer. As discussed earlier, the drinking water pathway was the subject of the AWS OUFS and should not be considered in this action. The potential incidental ingestion of solids pathway could be reduced as much, if not more, than the reduction provided in the preferred alternative with simple administrative actions. These administrative actions could include fencing of potentially contaminated areas, posting of signs, and the implementation of public awareness meetings. While these actions would not remove the source of potential contamination, they would reduce potential exposure to levels equal to, or lower than, that provided by the preferred alternative.

Likewise, the incidental ingestion and dermal absorption pathway -- although very insignificant exposure routes -- could be totally eliminated by prohibiting swimming in the identified contaminated waters. Since there are few sites with contaminated waters that are physically suitable for swimming and there are popular noncontaminated alternative sites for water-based recreation, fencing, posting and other administrative controls should be very effective at eliminating this exposure pathway.

Accordingly, the PRPs believe that the no action alternative, with appropriate administrative controls, would be as effective as the preferred alternative in protecting human health and the environment and that this alternative, on balance, may be the most cost-effective alternative to consider. We request that EPA re-evaluate the no action alternative as more than a basis for comparing other alternatives, and that EPA provide a detailed comparison of the effectiveness of this alternative, with appropriate and necessary administrative controls, to that of EPA's preferred alternative.

Summary and Conclusion

The PRPs believe that the comments contained in this letter clearly demonstrate that EPA's failure to properly acknowledge or take into account natural geologic conditions and phenomena occurring at the Galena Subsite has

resulted in an inaccurate description of the effects that mining has had on the area, a fundamentally flawed OUFS process, and the selection of a remedial alternative that cannot achieve its stated objectives. Accordingly, the PRPs believe that the only technically and legally supportable action is for EPA to acknowledge that, because of the natural geologic conditions, it is technically and economically impracticable to develop any effective remedial action, and to adopt the No Action Alternative. The No Action Alternative, with appropriate administrative actions to limit public exposure to metallic ions, would provide as much protection of human health as provided by the preferred alternative, and would not result in the unnecessary and unlawful expenditure of valuable CERCLA funds.

Thank you for your consideration of these comments and for including them in the administrative record for the Cherokee County Site.

Respectfully submitted,

ENVIRONMENTAL MANAGEMENT SERVICES COMPANY

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Principal

GDU:sam

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